CHAPTER 30 - Highway Traffic Noise Abatement

Table of Contents

CHAPTER 30 - Highway Traffic Noise Abatement

SECTION 1 - General Policy

Scope

Caltrans' noise abatement policy addresses the public's sensitivity to highway generated noise and the requirements for considering construction of noise abatement facilities when they are reasonable and feasible. The abatement of highway traffic noise is a design consideration that is required by State and federal statutes and regulations and by Caltrans' policy.

As part of the general environmental review process associated with all projects, project sponsors are required to evaluate if the project could result in substantially increased noise levels (termed "noise impact"); and when "reasonable" and "feasible", consider attenuating this increased noise. Using this policy and procedures, environmental studies may result in recommendations that proposed projects consider noise abatement to protect specific properties, along with preliminary designs for the abatement facilities. The Project Engineer (PE) should work with the Environmental unit in determining those preliminary designs. Later, as project details are developed, it is the responsibility of the PE to determine the feasibility and reasonableness of constructing the noise abatement facility; specifically where noise abatement facilities will be constructed, materials to be used and various other design details. Once these details have been determined, they should be reviewed by the District Environmental Unit and concurrence obtained. This Chapter provides basic guidelines to assist the PE in making the decisions they are responsible for. Specific structural and architectural design features of noise barriers, as well as other noise abatement facilities, are covered in other Caltrans manuals and the Standard Plans.

The three basic types of projects involving noise abatement include:

- The construction of new highways or the reconstruction of existing highways(see Chapter 2, Section 7, Federal Government, Determining the level of FHWA Project Oversight, Type of Work)..

- The construction of noise abatement features to retrofit existing freeways through residential areas (Community Noise Abatement Program).

- The construction of noise abatement features to retrofit existing freeways to reduce the level of freeway traffic noise that intrudes into public and privately owned primary and secondary schools (school noise abatement projects may be proposed as an element of the SHOPP).

Build at Ultimate Location When Possible

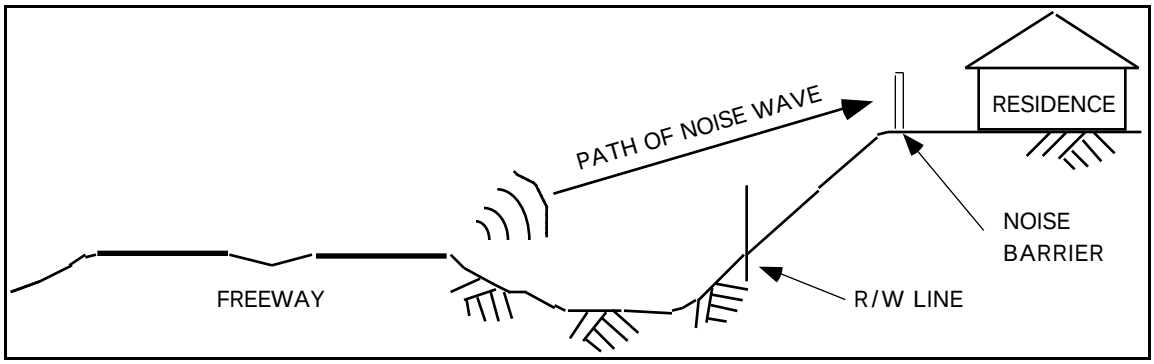
Noise barriers should be constructed at the ultimate location to accommodate a full standard facility or approved permanent nonstandard facility, meeting the transportation concept for number of lanes, when reasonable and feasible. A wall must not be constructed where planned future construction would limit its useful life to less than 15 years. If the route concept indicates the freeway will be widened, and the noise barriers are currently to be constructed adjacent to the shoulder, the design should provide for salvage in the future.

Noise Abatement Outside the Right of Way

Noise abatement facilities are normally constructed within the State highway right of way. However, under certain conditions it may be appropriate to construct them outside the right of way. The following factors should be considered when developing location and strategies for noise abatement facilities.

The topography between the noise source (i.e., freeway traffic) and the noise receptors (i.e., the adjacent residences) or other factors will sometimes not allow a noise barrier to be constructed at a reasonable height or at a feasible location within the right of way. Under these conditions, it may be more reasonable and feasible to construct the noise barrier on private property. Conditions which illustrate this are shown in Figure 1.

FIGURE 1 - Noise Barrier Proposed Outside State Highway Right of Way (Typical Section)



When analysis of traffic noise impacts determines that noise abatement should be considered for properties adjacent to the freeway, and when it is found to be more reasonable and feasible to construct a noise barrier for that abatement outside the State highway right of way, such construction may be implemented under the following conditions.

- A determination must be made that all (100%) of the affected property owners are supportive of the construction of the proposed noise barriers, their location and the materials to be used for construction.

- Each affected property owner must enter into a contract with Caltrans which specifies that they:

  - Agree to allow Caltrans personnel, representatives and contractors to enter upon their property for purposes of constructing the noise barrier and all other related work.

  - Agree to accept ownership and maintenance responsibility of their respective portion of the noise barrier upon its completion. When responsibility for maintenance is assigned to a property owner, it is done with the understanding that on a federally funded project, the FHWA will hold Caltrans responsible for that maintenance.

  - Agree not to remove the noise barrier without full consent of all other affected property owners and Caltrans.

  - Agree to allow Caltrans personnel and representatives to enter upon their property with appropriate prior notification for the purpose of periodic inspection of the noise barrier.

  - Agree that the contract provisions will be a permanent burden upon and a benefit for the property involved. The District Right of Way Branch will determine specific wording which, as a minimum, should include these provisions:

    "The term of this contract shall be a burden and a benefit which runs with the land, and shall inure to the benefit of and be binding upon the successors, assigns or transferees of the property owner."

- All parties to the contract must agree to record the document in the official records of the appropriate County Recorder's office.

This policy regarding the possibility of constructing noise barriers outside the right of way applies to all State highway projects regardless of funding for those projects.

Another noise abatement strategy which may be considered in rare and unusual cases is to provide noise insulation of the residential units. When this is being considered, the following guidelines must be complied with.

Noise insulation will not normally be provided in private residential dwellings, and may be provided only when severe traffic noise impacts are anticipated and normal abatement measures are physically not feasible or are economically unreasonable. When considering extraordinary abatement measures, it must be demonstrated that the affected activities experience traffic noise impacts to a far greater degree than other similar activities adjacent to highway facilities; i.e., private residential dwelling units will have after-project exterior noise levels of 75 dBA, Leq(h), or more, or the project causes a noise level increase of 30 dBA or more over predicted noise levels if no project was constructed. Noise insulation proposed in accordance with these criteria, on a Federal-aid project, is subject to approval of the FHWA. When noise abatement is provided for public or private properties in line with this

policy, an agreement must be entered into with the owner of the subject property which specifies that Caltrans is not responsible for any future costs of operating and/or maintaining the noise abatement improvements; i.e., air conditioning, caulking, etc.

Noise attenuation off the right of way is sometimes considered when there is a multistory residential building adjacent to the freeway. A noise barrier constructed at a height which provides attenuation for a single story building will usually not provide attenuation for the upper floors of the multistory building. When designing a noise barrier to provide noise attenuation for a multistory residential building, the noise barrier should not be designed to shield the floors above the ground floor unless the barrier provides at least a five (5) dBA reduction for a substantial number of residential units above the ground floor at a reasonable increase in cost.

Combine Noise Barrier Projects with Reconstruction Projects

When a retrofit noise barrier and a reconstruction project are programmed for the same facility in different years, an attempt should be made to reschedule the projects to combine them.

Cost Effectiveness

The cost effectiveness calculation for determining the reasonableness of a noise barrier should include the cost of any necessary widening, retaining walls, drainage, right of way, etc., needed to accommodate the noise barrier if those features will not be funded by another programmed project.

Residents' Desires

The views and opinions of the residents living immediately adjacent to the freeway and affected by the traffic noise must be considered in reaching a decision on noise abatement measures. Noise barriers will not be provided if 50% or more of those affected residents do not want them. The opinions of these residents should be obtained through public hearings, community meetings or other means as appropriate. [For Federal-aid projects FHWA's regulations require that the views (i.e., opinions) of the affected residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided.]

The opinions of those affected residents should also be considered regarding the height of proposed noise barriers. If the majority of those residents object to the proposed height of the noise barrier, the barrier may be constructed at a lower height under certain conditions. The affected residents should be informed of the proposed height of the noise barrier determined necessary by noise analyses. If they request a lower noise barrier, the shorter height may be constructed if it will still reduce the noise by a minimum of 5 dBA and if the line of sight to the truck exhaust stack height (3.5 m) is broken.

During preliminary design, consideration must be given to the opinions from the adjacent residents on all relevant factors, such as whether they favor the construction of the proposed noise abatement facilities, heights of the proposed facilities, materials to be used, etc. When the final design proposes significant revisions to the preliminary design, attention must be given to verify that the proposal will still be commensurate with the desires of the impacted residents.

Alternative Designs Required

Highway Design Manual Topic 1102 requires at least two noise barrier design alternatives be included in each project. Alternative materials or methods should be considered in order to increase competition and reduce project costs. Exceptions to this requirement may be approved at the District Division Chief level. The opinions of the impacted residents should be considered when selecting the alternative materials and methods.

Questions regarding products and methods approved for use on Caltrans projects should be directed to the Office of State Noise Abatement and Accessibility Design Standards in the Headquarters Design and Local Programs Program. The list of approved products is constantly being expanded to include recycled materials, new concrete designs, and various other materials.

Projects which will be financed by others (tax measures, local agencies, developers, etc.) are not required to include the minimum two design alternatives. However, the advantage of having more than one alternative should be pointed out to the project funder.

Emergency Access Openings

Emergency-service agencies often express the need for emergency personnel access gates to be installed in noise barriers. The gates would be used to provide a means to evacuate trapped or injured persons from the freeway in the event a large-scale earthquake or other type of catastrophic event makes the freeway impassable for emergency vehicles. These gates may be placed in noise barriers when there are no other means of providing access to the freeway. These gates are not intended to be used as an alternate means of emergency access to the adjacent neighborhoods. Access to those areas should be planned and provided for from local streets and roads.

Another need often expressed is for small openings through noise barriers to allow for the passage of fire hoses. Provision of these openings may be allowed when there is no other means of providing fire protection on the freeway.

Local emergency response agencies should be contacted early in the project development process to determine the need for the gates and the fire hose openings. Where possible, the emergency access gates and fire hose openings should be combined. When there is need for access gates to be used by Caltrans Maintenance forces, their needs should be combined with the emergency gates when possible.

Use of Plants With Noise Barriers

Where noise barriers are warranted, they should be designed as part of the total transportation facility. This is achieved by coordinating the planning and design of all transportation facility elements; i.e., alignment and profile of the traveled way, drainage features, contour grading and landforms, other structures, existing planting, new planting needs and the required barriers. This concept should be followed throughout the project development process.

Noise barriers, land forms (slopes and berms), and plantings should be integrated features of the transportation corridor, and should be planned, designed, constructed and maintained to complement one another. Use of plants as integral components of and as complements to noise barriers should be considered, if at all feasible. The objective is to reduce life-cycle costs of the improvements. Planting should be used to combat graffiti, to reduce construction costs by building cost-effective barriers, and to enhance public acceptance.

Where plants are to be used as a cover or appliqué for aesthetics and graffiti control, the District should involve the local community which has a strong interest in protecting the community's image and seek participative involvement in protecting the plants from vandalism. This may be accomplished by cooperative agreements or the Adopt-a-Highway Program.

Planting will be considered part of a noise barrier for funding purposes. Planting may be included as part of the barrier project or as a separate contract if more cost-effective. Planting as an element or component of a noise barrier is not subject to the cost limitations of Standard Highway Planting.

Consideration of Environmental Resources

There are various environmental resources which may be impacted by the proposed construction of noise abatement facilities. Those resources which have the greatest potential for being impacted are wetlands, archeological and historic sites, and scenic resources. An overall mitigation and attenuation plan should be developed, balancing the noise impacts and the environmental impacts which would be incurred if noise attenuation is constructed. A visual assessment by the District Landscape Architect to analyze the project impacts should be carried out during the environmental studies when an initial review concludes that a proposed project may have an effect on a scenic resource (see Chapter 29, Section 2, Article 3). The visual assessment can help determine if the potential impact is significant and what mitigation measures may be appropriate. If a project may impact an eligible or designated scenic highway, the district scenic highway coordinator should also be involved in the evaluation.

Caltrans must consider and preserve scenic values and resources along officially designated Scenic Highways (see Chapter 1, Section 4, Article 2, and Chapter 29, Section 1) and along highways with scenic values. This requires a thorough evaluation of the benefits of noise attenuation and its impact on visual resources. This evaluation will normally be conducted as part of the project's environmental studies. However, the PE must be aware of the special considerations required, and must verify that the necessary evaluations have been made.

Value Analysis and Life-Cycle Cost Analysis

Chapter 9, Article 9, addresses the need to consider Value Analysis (VA) studies for all noise barrier projects. The VA studies should consider that the basic aim is to achieve satisfactory noise reduction. Specific considerations are:

— Are there non-wall alternatives?

— Can part or all of the reduction be achieved using an earth mound?

— Are there materials which would be acceptable at this location which have not been tried previously?

— Can the need for a safety shape barrier be eliminated by relocating the wall?

— Is the barrier located so that future maintenance costs will be minimized?

— Can expensive aesthetic treatments be reduced or eliminated by judicious use of planting?

These are only a few of the questions which an innovative VA team should consider.

Project files for each project which incorporates a noise barrier should include the justification and background for the design type or the options allowed.

Beyond the very basic questions to be addressed in a VA study, a Life-Cycle Cost Analysis should be conducted for the various types of noise barriers considered for the project. A number of factors are involved in planning, designing, constructing and maintaining noise barriers. Some of these factors are difficult to evaluate. A list of these factors should be used to test any types of barrier being studied, and to justify the barrier material type that is proposed to be built. The analysis will often be different for a given design type depending on whether it is located adjacent to the traveled way or nearer to the right of way line. The life-cycle cost analysis should include all associated costs, including any planting, landscape maintenance and irrigation costs required.

The Value Analysis and Life-Cycle Cost Analysis should be conducted prior to making any presentations of noise abatement options to the public. These studies should be the basis for the alternatives presented at any public meetings.

Reasonableness and Feasibility

Environmental studies may result in recommendations that a proposed project consider providing noise abatement to protect specific properties. However, noise barriers should be constructed only if they are determined to be "reasonable" and "feasible." Making this determination is among the responsibilities of the PE.

Reasonableness

Reasonableness is a more subjective criterion than feasibility. It implies that common sense and good judgment have been applied in arriving at a decision.

The final determination of reasonableness will be made only after a careful and thorough consideration of appropriate factors. Regard should be given for the individual circumstances of each particular project.

In making a reasonableness analysis, consideration should be given to the following, with the understanding that these items are not all-inclusive. Guidance on how to consider these criteria is included in Section 3.

Reasonableness Factors

- Cost effectiveness

  Cost effectiveness should be considered for any proposed noise mitigation. While there is no firm cost effectiveness criterion for noise barriers considered for new highway construction or reconstruction projects, the criterion specified for retrofit noise barriers should be used as a guide. Section 3 provides details on the cost effectiveness criterion.

- Change in noise levels

  Mitigation of traffic noise for new highway construction or reconstruction projects should be considered only if the predicted noise level caused by the roadway improvement project exceeds the criteria indicated by Figure 3. This takes into consideration the difference between the future noise levels for the build alternative and the no-build alternative.

- Development along the freeway

  Consideration should be given to the amount of development that occurred before and after the initial construction of the freeway and the type of development (e.g., residential versus commercial). The relative dates for when adjacent land development is "planned, designed and programmed" and the "date of public knowledge" of the proposed transportation project will be used to determine the reasonableness of providing noise abatement as part of the proposed transportation project.

  Environmental studies will include a traffic noise analysis for developed lands and for undeveloped lands where development is planned, designed and programmed. If a traffic noise impact is expected to occur where development has occurred, or where development is planned, designed and programmed, noise abatement measures must be considered as part of the transportation project. Development is considered to be planned, designed and programmed if a noise-sensitive land use, such as a residence, school, church, hospital, library, etc., has received a building permit from the local agency with jurisdiction at the time of the noise analysis.

  The date of public knowledge of the proposed transportation project is used to determine if noise abatement should be part of the project, or if noise abatement is the responsibility of local governments or private developers. The date of public knowledge shall be the date that a project's environmental analysis and documentation is approved, i.e., the date of approval of CEs, FONSIs or RODs. After this date, Caltrans is still responsible for analyzing changes in traffic noise impacts, when appropriate, but is no longer responsible for providing noise abatement for new development which occurs adjacent to the proposed transportation project. Provision of such noise abatement then becomes the responsibility of local communities and private developers.

Additional Reasonableness Considerations

- Environmental impacts of abatement construction

  Consideration should be given to the effects on the social, economic and natural environment caused by the construction of a noise barrier. This includes the potential impacts on scenic resources and scenic corridors which are addressed above. For new highway construction or reconstruction projects, consideration should be given to the benefits which may be realized by the adjacent residents by having a noise barrier in place prior to the work being performed on the roadway project.

- Land use controls

  Consideration should be given to the likeliness of the qualifying area to change land use designation within the life cycle of the project. Working with the local agency responsible for the land use designation (i.e., local city or county) will determine if redevelopment of the subject area is a strong possibility. A written statement from the local agency should be obtained for documentation that redevelopment is likely. If it is likely to be redeveloped, it may be prudent to defer the construction of the noise barriers until a final decision is known.

  Qualifying properties that are redeveloped subsequent to the project action are not eligible for noise attenuation to be provided as part of the project. Furthermore, it is appropriate to work with the local agency to identify compatible land use designations (i.e., commercial or business/professional) and appropriate conditions (i.e., developer-built noise barriers to State Standards) for property adjacent to State facilities.

- Large noise impacts

  Consideration should be given to noise impacts that are far greater than the normal experienced impacts; i.e., exterior noise levels of 75 dBA, Leq(h), or higher, or a projected noise level increase of 30 dBA, or more, over existing levels.

- Residents' views

  The residents' desires should be considered when noise attenuation is otherwise found to be reasonable and feasible. If 50% or more of the affected residents do not want the noise barriers, the barriers will not be constructed. (See earlier discussion for more detail.)

- Outside Construction

  When outside lanes and shoulders are reconstructed for outside widening projects, consideration should be given to providing noise barriers if the predicted noise level approaches or exceeds the NAC, even if it is found to be technically unreasonable. Factors to be

considered in this regard would be the opinions of the affected residents toward the construction of noise abatement facilities.

Feasibility

Feasibility is defined with regard to engineering considerations. A 5 dBA noise reduction must be achieved in order for the proposed noise barrier to be considered feasible. Ability to achieve an adequate noise reduction may be limited by: (1) topography; (2) access requirements for driveways, ramps, etc.; (3) the presence of local cross streets; or (4) other noise sources in the area.

SECTION 2 - New Highway Construction or Reconstruction

Policy

Reasonable and feasible noise abatement measures should be incorporated into new or reconstruction highway projects (see definition of new and reconstruction in Chapter 2, Section 7). Federal-aid highway projects of this type are classified by the Federal Highway Administration as Type I. See headings in Section 1 for definitions of the terms reasonable and feasible.

Noise Abatement Criteria

Noise Abatement Criteria (NAC) for various Land Use Activity Categories are shown below.

FIGURE 2 - Noise Abatement Criteria (NAC)

Activity Category	Hourly A-Weighted Sound Level dBA, Leq(h)	Description of Activity Categories
A	57 exterior	Lands where serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 exterior	Picnic areas, recreation areas, playgrounds, active sport areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 exterior	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

General

Noise attenuation requirements under California law (i.e., the California Environmental Quality Act-CEQA) differ from the requirements of the FHWA, which are based on Title 23, Code of Federal Regulations, Part 772 (23 CFR, Part 772). Both standards have mitigation requirements when noise effects will substantially increase the ambient noise levels of adjacent areas. Under CEQA, a

substantial increase in noise will result in a significant effect and must be mitigated or "Findings" made. Under FHWA regulations, a traffic noise impact must be mitigated when the predicted noise levels "approach or exceed" the NAC or when the predicted noise levels substantially exceed predicted noise levels without the project and it is reasonable and feasible to mitigate.

When a noise analysis is to be conducted for a project, one of the first decisions made is to determine which requirements are applicable. Following that decision, Environmental personnel will make the analysis by taking into consideration a number of factors. The following overview of those factors is presented for information of the PE. More detail on these factors can be obtained from the district Environmental Unit

California Requirements (CEQA)

A determination must be made whether the proposed project will substantially increase the ambient (existing) noise levels for adjacent areas.

If there is a substantial increase in noise, the noise must either be mitigated or identified as a noise impact for which it is likely that no, or only partial, abatement measures are available, for reasons including specific economic, social, or other conditions which make additional noise attenuation measures unfeasible. If noise abatement is found to be reasonable and feasible, noise barriers should be constructed.

FHWA

Traffic noise impacts occur when the predicted noise levels approach or exceed the NAC, or when the predicted noise levels with the project substantially exceed the predicted noise levels without the project. When noise impacts occur, abatement must be considered and mitigation must be provided when reasonable and feasible.

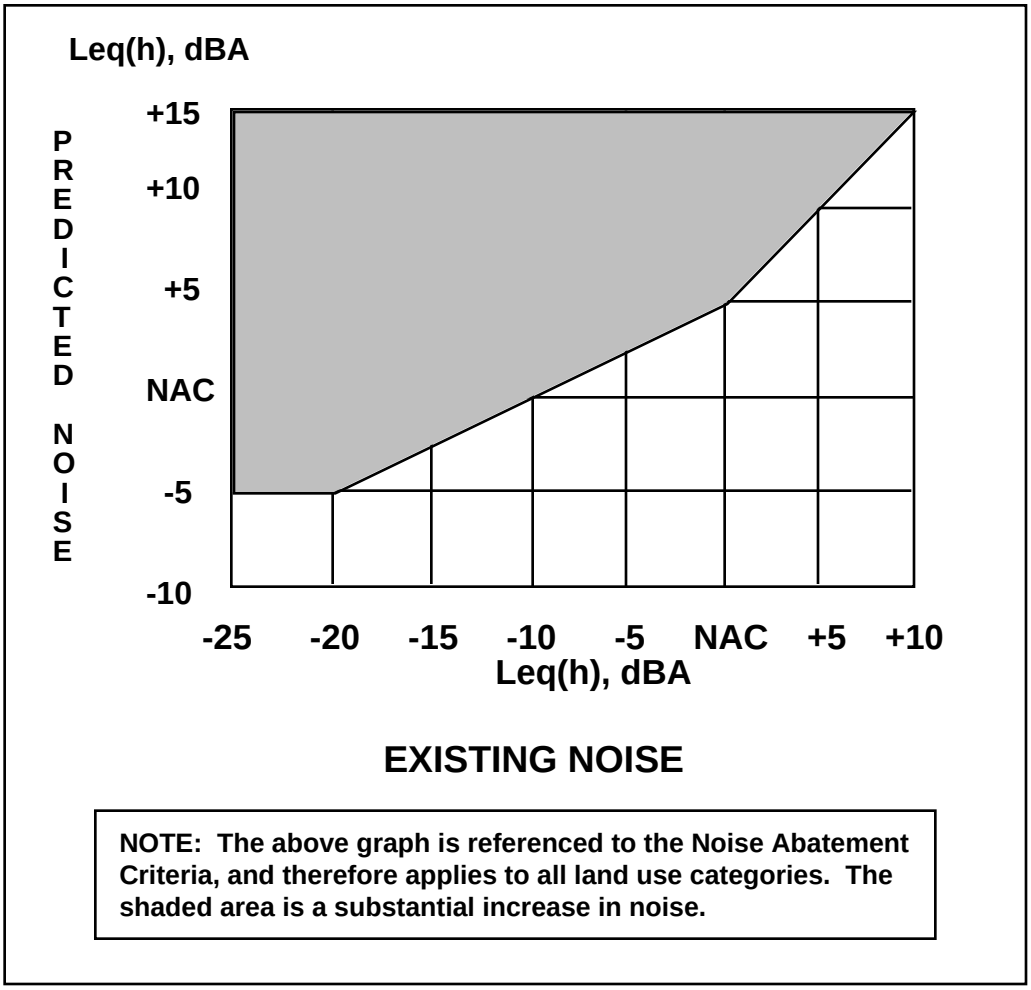
Substantial Noise Increase

The determination of whether a noise increase is considered to be substantial is dependent, in part, on the existing noise level. Caltrans considers a noise level increase to be substantial when the proposed project will result in an increase of the following amounts at a sensitive receptor.

- When the future noise level, Leq(h), without the project exceeds the NAC, and the increase is expected to be at least 5 dBA, Leq(h).
- When the future noise level, Leq(h), without the project is more than 20 dBA below the NAC, and the expected increase results in a predicted noise level, Leq(h), to within 5 dBA below the NAC, or higher.
- When future noise levels, Leq(h), without the project are between 20 dBA below and the NAC, and, on a sliding scale, increases between at least 15 and 5 dBA, Leq(h), respectively, are expected.

These criteria are represented graphically in Figure 3.

FIGURE 3 - Substantial Noise Increase for All Land Use Categories



Approaching the Noise Abatement Criteria

For the purposes of noise analysis on new highway construction or reconstruction projects, when the predicted noise level reaches 1 dBA less than the NAC, it is considered to be approaching the NAC for all land-use categories.

Design Considerations to Mitigate Noise

If traffic noise impacts have been identified, mitigation must be considered and all reasonable and feasible noise abatement measures must be included in the project.

Mitigation measures may include, but are not limited to the following:

- Design alternatives which result in lessening the noise effect. For example, alteration of horizontal and vertical alignment.
- Construction of noise barriers.
- Noise insulation.

If the project location is flexible, horizontal alignments can be selected away from sensitive noise receivers. Or if the horizontal alignment is fixed, perhaps the vertical alignment can be altered to a depressed highway, which reduces noise. Most often, highway alignments are selected on the basis of other overriding factors. The construction of noise barriers is then the most common option available. In some cases, including school noise abatement projects, noise insulation, sealed double-paned windows, and air-conditioning can be used effectively for noise mitigation.

Minimum Attenuation

The Noise Abatement Criteria were developed as a guide to identify traffic noise impacts, and should not be considered as design goals for noise reduction. When designing a noise barrier, the goal should be in terms of the amount of noise reduction provided by the barrier, rather than an attempt to satisfy the NAC. When a noise barrier is proposed, it must achieve a "substantial reduction" (a minimum noise reduction of 5 dBA). An exception to this criterion would be appropriate in some cases, such as where a gap between two noise barriers is closed to provide continuity.

Determination of Reasonableness

A discussion of general considerations to be given to Reasonableness and Feasibility is included in Section 1. This Section will provide more details regarding the determination of Reasonableness.

The six criteria shown below should be used to make a basic determination of the reasonableness of constructing a noise barrier for new and reconstruction projects. It is recognized there may be instances where abatement should be found to be reasonable and feasible even though it is found to fall outside some of these criteria. Therefore, these criteria should not always be rigidly applied.

Reasonableness Criteria

1. The barrier cost per residence.

   Note: Evaluation of the cost-per-residence should be based on the cost-effectiveness criterion from the Retrofit Program (See Section 3) which is subject to periodic adjustment.

2. The percentage of the impacted housing development that predated the initial highway construction.

3. The percentage of the impacted housing development which has been in place for at least 10 years.

4. The future "build" noise levels (i.e., with the proposed project).

5. The increase in the proposed project’s "build" noise levels over the existing noise levels.

6. The increase in the proposed project's future "build" noise levels compared to the future "no-build" noise levels.

Additional Reasonableness Considerations (when appropriate)

1. Environmental impacts
2. Enforcement, or lack of enforcement, of land use controls by local agencies
3. Large noise impacts
4. Residents' views
5. Outside reconstruction

Scoring Reasonableness Considerations of Noise Abatement

An objective scoring method for considering the six Reasonableness Criteria above is included as Appendix FF. Project Engineers are encouraged to make use of this scoring method as part of their determination of the reasonableness of proposed noise abatement facilities.

SECTION 3 - Retrofit Noise Barriers on Existing Freeways

General

The policies in this Section are governed by Sections 215.5 and 215.6 of the Streets and Highways Code. For Federal-aid highway participation, the retrofit noise barrier program is also governed by applicable sections of Title 23 Code of Federal Regulations (23 CFR) Part 772 covering Type II projects, a project type classification by FHWA on existing freeways with development predating the freeway.

Qualifying Areas

Retrofit noise barrier proposals on existing freeways vary in their qualifications for funding depending on their funding source. Locally funded proposals are not subject to these restrictions:

- State Only Funded:

  Qualifying developed areas must meet all of the following conditions to satisfy state statutes (Sec. 215.5 of the Street and Highways Code):

  - Existing freeway location
  - Residential area
  - Noise level must be higher than 67 dBA, Leq(h)

- Funded Using Federal-aid:

  Federal criteria, consistent with Title 23 CFR 772 for Type II projects, indicate that noise abatement measures will only be approved for projects that were approved before November 28, 1995, or are proposed along lands where land development or substantial construction predated the existence of any highway.

Priority Index for Retrofit Noise Barrier Projects

A priority index (PI) is calculated for each project proposed for programming where the measured or adjusted noise levels exceed the Noise Abatement Criteria (NAC) for Activity Category B [67 dBA, Leq(h)]. The formula used for the PI considers achievable reduction (AR), measured noise levels above 67 dBA (NL), number of living units (LU), and the cost of the proposed noise barriers in thousands of dollars:

$$PI=(AR)(NL-67)^2(LU)/Cost(\$1000)$$

The AR is the average reduction in noise levels that the proposed noise barrier will achieve. The NAC of 67 dBA, Leq(h) is a goal for achievement, but is not

mandatory. However, any noise barrier considered under this program must provide a minimum of 5 dBA noise reduction.

The NL is the average of field-measured noise levels, dBA, Leq(h), adjusted to future design hour noise levels using computerized versions of the FHWA Highway Traffic Noise Prediction Model with California Vehicle Noise (CALVENO) reference energy mean emission levels.

The LU is limited to the residences immediately adjacent to the freeway (i.e., first line receivers). Residences located above the first floor in multistory units are included in the residential count only if the proposed barrier will provide a 5 dBA reduction for these units.

The project Cost in $1,000s used in the calculation includes all costs directly related to the proposed noise barriers. This includes items for earthwork, structural section, drainage, traffic control, structure work, planting and other specialty work, as well as the noise barrier itself.

For projects which include noise barriers at multiple locations, the overall project's PI is calculated independently for each location. The PI for the combined project is calculated using a weighted average method, with the weighting based on the number of residential units protected at each location.

Priority Adjustments

One of the factors for determining priority is whether a majority of the occupants in close proximity to the freeway resided there prior to the time the freeway routing was adopted by the CTC. The city or county in which the residential area is located is responsible for providing Caltrans with documentation on percentage of original occupants still residing along the freeway.

If a city or county submits documentation for a specific project that shows the majority of the current occupants in close proximity to the freeway resided there prior to the adoption of the freeway, the PI calculated by the above formula is enhanced by an amount equal to the actual percentage of occupants currently still residing there. For example, if the PI for a project is calculated to be 10.00 and the documentation furnished by the local agency indicates that the current residing percentage is 52.5 %, then the priority index is adjusted to 62.5.

The following definitions apply in determining percentage of original occupants still residing along the freeway:

- Majority - Over 50% of total persons living in dwelling units that are in close proximity or immediately adjacent to the freeway.

- Occupants - Person or persons who are currently occupying the dwelling units under consideration.

- In Close Proximity - The area encompassed by residential units immediately adjacent to the freeway (same first line receptors used in Priority Index formula).

If the current occupant or occupants are the owners, then the date of purchase is submitted as documentation. For rental and leased properties, a statement is obtained from the landlord of the date occupancy commenced. For occupants other than principal occupants, a statement from the principal occupants is obtained that shows the date these occupants first began to reside in the residence.

If any city or county contributes at least 33 percent of the estimated cost of any soundwall project included for the first time in the State Transportation Improvement Program (STIP), starting in 1992, the project is given priority over all other soundwall projects included for the first time in that STIP. If due to the accelerated priority given a project two or more projects each qualify for the highest priority, the relative ranking between the projects is determined on the basis of their relative ranking prior to being accelerated.

Cost Effectiveness

Projects on the Priority List must be "cost effective". Projects are considered to be cost effective if they cost no more than the criterion established for each residential unit protected by the barrier. The cost effectiveness criterion was established as $35,000 for the 1996 and 1997 calendar years. This criterion will be adjusted each two years by using the California Construction Cost Index as a guide. The adjusted criterion will be issued in each even-numbered year by the Headquarters Noise Abatement Program Manager. Any questions on this should be directed to the Headquarters Noise Abatement Program Advisor in the Environmental Program.

The project's cost effectiveness calculation should include all living units (houses, apartments, and condominiums, etc.) that will benefit by a reduction of 5 dBA or more as a result of the noise barrier construction.

Project Costs

The project cost used in making the cost-effectiveness calculation should be the same as that used for calculating the Priority Index. This same cost should also be used for programming the project unless it is combined with other projects. While all of the directly associated costs should be included in the cost effectiveness calculation, costs associated with other improvements should not be included. For example, if a noise barrier is designed on top of a retaining wall, where the retaining wall would be provided to allow for future widening, the cost of the retaining wall and any embankment and structural section placed behind it should not be included. The cost of work to provide for future widening will have to be funded from other sources. If funding is not available to program the other work, the noise barrier cannot be programmed.

Project Features

Only project features directly attributable to retrofit sound walls are eligible for funding from the Retrofit Sound Wall Program. Acceptable project features associated with Retrofit Sound Wall Program projects are:

- Drainage modifications as a result of noise barriers
- Safety treatments as a result of noise barriers

- Miscellaneous asphalt paving
- Traffic control , etc.

Inappropriate project features are:

- Widening (including retaining wall for Retrofit Sound Walls)
- Any other items not related to Retrofit Sound Wall construction.

SECTION 4 - School Noise Abatement Projects

Streets and Highways Code Requirements

Section 216 of the Streets and Highways Code requires Caltrans to mitigate noise that intrudes into specified areas within public and private elementary or secondary schools when that noise is generated by freeway traffic or by the construction of the freeway. The areas eligible for protection from the noise are those which are used as classrooms, libraries, multipurpose rooms, and spaces used for pupil personnel services. When the levels within these areas exceed 52 dBA, Leq(h), Caltrans is required to attenuate the excessive noise. The Code establishes qualifying criteria that include the time of school construction and current use of the school. Projects under these criteria should be proposed as SHOPP projects, as there is no longer a program specifically for school noise abatement.

Available Options

Noise abatement options include construction of a noise barrier, acoustical treatment of the school structure, or a combination of both. Acoustical treatments may include installing insulation, multipane windows and air conditioning equipment. If these treatments are undertaken, the windows must also be sealed to prevent their being opened, which would render the improvements ineffective. A preliminary investigation should be made to determine which method of attenuation is the most appropriate.

Agreements with Schools

When it has been determined that acoustical treatments of the school structure should be undertaken, an agreement with the School District should be prepared to specify each parties' responsibilities for developing and implementing the project. Typically, the School District will retain an architect to identify the necessary improvements and to design the contract plans, and the School District will award and administer the construction contract. Caltrans' responsibilities are typically confined to reviewing the scope of work proposed, verifying that the work has been satisfactorily completed and for reimbursing the School District for their expenses. Preapproved Cooperative Agreement Forms for School Noise Abatement projects are contained in Appendix 3 of the *Cooperative Agreement Manual.*